

REMARKS

Reconsideration of the present application is respectfully requested.

Summary of Examiner Interview

A telephonic interview was conducted between the Examiner and Applicants' representative (the undersigned) on December 13, 2007. Claim 11 was discussed. In particular, an embodiment of the present invention and Examiner's interpretation of the cited art were discussed. Agreement was not reached.

Summary of Office Action

Claim 11 stands rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention.

Claims 11, 12, 14, 16, 23 and 30-36 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Application No. 2001/0036181 to Rogers (hereinafter "Rogers").

Summary of Amendments

Claims 11, 12, 14, 16, 23 and 30-36 are pending. Claims 11, 12, 23, 30, 34, 35 and 36 are currently amended. No claims are canceled. No claims are added. No new matter has been added.

Response to Rejections under 35 U.S.C. § 112

The Office Action rejected claim 11 under 35 U.S.C. § 112, second paragraph. In particular, the Office Action stated that the limitation "each of the shared resources is assigned to one of the scheduling domains" is unclear and vague. Applicants respectfully submit that claim 11 has been amended to recite "one or more resources shared by the tasks... wherein each of the one or more resources is assigned to one of the scheduling domains." Applicants submit that the claim as amended is clear and definite on its face, and particularly when read in light of the specification. The shared resources, while being assigned to one scheduling domain, may be available to all tasks. Figure 2 illustrates that a resource associated with a particular scheduling domain may be shared by multiple tasks within that scheduling domain or by a task in a different scheduling domain if the task switches scheduling domains to become associated with the same

scheduling domain as the resource. See Specification, Page 14 lines 2-12 and Page 15 line 7- Page 16 line 3. Therefore, Applicants respectfully request that the rejection of claim 11 under 35 U.S.C. § 112, second paragraph, be withdrawn.

Response to Rejections under 35 U.S.C. § 103(a)

The Office Action rejected claims 11, 12, 14, 16, 23 and 30-36 under 35 U.S.C. § 103(a) as being unpatentable over Rogers. Applicants respectfully request withdrawal of these rejections because the cited reference fails to teach or suggest all of the limitations of the claims.

The present invention generally relates to a method for scheduling tasks in a multiprocessor system and providing parallel or concurrent execution of those tasks while implicitly synchronizing access to resources used by that system. In one embodiment of the present invention, scheduling domains are used for scheduling tasks. At least one scheduling domain is associated with at least two tasks and a resource, such as a data structure, shared by the at least two tasks. Implicit synchronization is achieved by prohibiting tasks associated with one scheduling domain from running in parallel or concurrently. A scheduling domain is not bound to any one processor and can potentially have a task executing on any processor in the system provided no other tasks associated with the same scheduling domain are currently running. With the above remarks in mind, attention is directed to independent claim 11 of the present invention.

Claim 11, as amended, recites:

A method comprising:

running a plurality of tasks in a multiprocessor system that includes a plurality of processors;

scheduling the plurality of tasks using a plurality of scheduling domains **by scheduling tasks on a processor independent of the identity of the processor, wherein none of the plurality of scheduling domains is bound to any one processor of the plurality of processors;**

implicitly synchronizing the tasks with regard to one or more resources shared by the tasks in said system by associating said tasks with the scheduling domains, wherein each of the one or more resources is assigned to one of the scheduling domains;

prohibiting tasks that are each associated with a same scheduling domain from running concurrently;

allowing tasks that are each associated with different scheduling domains to run concurrently; and

changing association of a task of the plurality of tasks from a first scheduling domain to a second scheduling domain, if the task requests a resource assigned to the second scheduling domain.

(Emphasis added).

Applicants respectfully disagree with the Office Action's characterization of the prior art because Rogers fails to teach or suggest all of the limitations of the claim. In particular, Rogers does not teach or even suggest scheduling the plurality of tasks using a plurality of scheduling domains by scheduling tasks on a processor independent of the identity of the processor, wherein none of the plurality of scheduling domains is bound to any one processor of the plurality of processors.

Rogers is directed to switching data packet flows by assigning schedules to guaranteed delay and bandwidth traffic. Rogers, Abstract. The switches in Rogers provide dynamic bandwidth allocation which alleviates transmission problems caused by bandwidth contention. Rogers, paragraph 0026. Rogers teaches that the flow of packets through the switch is directed by multiple packet processors which are used to make a determination of packet destination. Rogers, paragraphs 0083-0084. The packet processors may have multiple queues for both transmitting and receiving packets. The packet processors can place a packet on a queue or, in some instances, send the packet to another packet processor for transmission. Rogers, paragraph 0084. If the packet processor determines that the packet should be transmitted to another packet processor, the packet processor will transfer the packet to a fabric interface controller which will then transfer the packet. Rogers, paragraph 0085. Thus, each packet must be processed by a specific packet processor. If one processor receives a packet for processing, it may determine that it cannot process the packet and the packet must be sent to another packet processor for processing.

In contrast, claim 11 recites in part, "scheduling the plurality of tasks using a plurality of scheduling domains by scheduling tasks on a processor independent of the identity of the processor, wherein none of the plurality of scheduling domains is bound to any one processor of the plurality of processors." The scheduling of tasks is done symmetrically, so that no tasks (or scheduling domains) are bound to any particular processor. The identity of the processor is irrelevant for purposes of scheduling. A task (associated with a scheduling domain) is just as likely to run on one processor as it is on any other. See Specification, page 11 lines 2-6. Accordingly, a processor would be able to schedule any task as long as no other tasks in the same scheduling domain are currently being run. See Specification page 19 line 1 to page 20 line 18.

Additionally, Rogers does not teach the use of scheduling domains much less changing association of a task of the plurality of tasks from a first scheduling domain to a second scheduling domain, if the task requests a resource assigned to the second scheduling domain. The packet processors taught by Rogers are not scheduling domains. The packet processors do not contain tasks or resources shared by the tasks and the packet processors are bound to process a specific set of packets. Rogers teaches that a packet may be switched between packet processors. If the packet processor determines that the data packet should be transmitted to another packet processor, the packet processor will transfer the packet. Rogers, paragraph 0085. However, this is not done in response to a request for a resource assigned to a queue of a different packet processor. Instead this determination is made based on the destination of the data packet and which processor is capable of processing the packet. Rogers, paragraph 0084. Thus, Rogers does not teach or suggest the use of scheduling domains or changing association of task from one scheduling domain to another. Therefore, claim 11 is even more patentable over Rogers.

Given that the cited reference fails to disclose all of the limitations of the claim, Applicants respectfully submit that claim 11 is patentable over the cited reference. Accordingly, Applicants requests that the rejection of claim 11 under 35 U.S.C. § 103(a) be withdrawn.

Independent claims 12, 23, 30, 34, 35 and 36 recite similar limitations to those in claim 11 discussed above and other limitations. Therefore, claims 12, 23, 30, 34, 35 and 36 are also patentable over the cited art for similar reasons. Given that claims 14, 16 and 31-33 directly or indirectly depend from one of the above independent claims, at least for reasons similar to those discussed above, it is respectfully submitted that dependent claims 14, 16 and 31-33 are patentable over the cited references. Accordingly, Applicants respectfully request reconsideration in view of these remarks.

Applicants have not necessarily discussed here every reason why every pending independent claim is patentable over the cited art; nonetheless, Applicants are not waiving any argument regarding any such reason or reasons. Applicants reserve the right to raise any such additional argument(s) during the future prosecution of this application, if Applicants deem it necessary or appropriate to do so.

Dependent Claims

In view of the above remarks, a specific discussion of the dependent claims is considered to be unnecessary. Therefore, Applicants' silence regarding any dependent claim is not to be interpreted as agreement with, or acquiescence to, the rejection of such claim or as waiving any argument regarding that claim.

Conclusion


For the foregoing reasons, the present application is believed to be in condition for allowance, and such action is earnestly requested.

If there are any additional charges/credits, please charge/credit our deposit account no. 02-2666.

Respectfully submitted,

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